

Remarks/Arguments

Examiner Shakeri is thanked for his efforts and thorough examination.
Applicant respectfully requests entry of the amendments.

In the Claims

For parent claims 27, 50 and 55 a limitation similar to the following is added:
“at least a portion of said first groove not adjacent to the lower surface has a rounded cross-sectional contour along substantially the entire length of said first groove.”

Claims 37, 38, 43, 47, 48 and 50 are amended to provide proper antecedent basis for the CMP retaining ring.

Parent Claim 37 is amended to state “ at least a portion of said first groove not adjacent to the lower surface has a rounded cross-sectional contour along substantially the entire length of said first groove.” For support see figures 3A and 3B.

Claim 37, lines 6 – 8 is amended. For support see claims 39 and 40, see figs 3A, 3B, 4A. This amendment further clarifies what was already claimed and is not a further narrowing of the claim.

Claim 37 adds a whereby clause in the last line. For support see spec. p. 11, LL 14 – 16; p. 12, LL 20-21.

Parent claims 37, 50 and 55 are amended to delete “~~or slanted cross-sectional contour.~~”

Claim 39 is amended. For support see figures 3A, 3B, and 4A. The first inner and outer peripheral openings shown in the figures are implicit in the previous claim 39 limitation “said plurality of grooves only communicate between said inner peripheral surface and said outer peripheral surface;”.

Claim 40 is amended. For support see claim 37 and see figs 3A, 3B, and 4A.

Claim 41 is amended. For support see figs 3A, 3B, and 4A.

Claim 42 is amended. The amendment clarifies the existing limitation and makes explicit what is implicit. For support see figs 3A, 3B, and 4A.

Claim 44 is amended. For support see figures 4A, 4B and 4C.

Claim 50 is amended. For support see claims 39 and 40; see figs 3A, 3B, and 4A. Claim 50 has a similar amendment to claim 37 “at least a portion of said first groove not adjacent to the lower surface has a rounded cross-sectional contour along substantially the entire length of the first groove”.

Claim 51 is amended. For support see figs 3A, 3B, and 4A.

Claim 52 is amended. For support see figs 3A, 3B, and 4A.

Claim 54 is amended. For support see figs 3A, 3B, and 4A.

Parent method claim 55 is amended. See claims 39 and 40, see figs 3A, 3B, and 4A. Parent claim 55 has a similar limitation to claim 37. This amendment further clarifies what was already claimed and is not a further narrowing of the claim.

Claim 57 is amended. The first inner and outer peripheral openings are shown in all the figures are implicit in the previous claim 39 limitation “said plurality of grooves only communicate between said inner peripheral surface and said outer peripheral surface;”.

Dependent claim 59 is amended. For support see claims 56 and 57; See figure 4A, 4B and 4C.

Dependent claim 60 is amended to change “the” to –a--.

No new matter is added.

Applicant respectfully requests entry of the amendments.

EXAMPLES OF SOME NON-LIMITING EMBODIMENTS

Applicant’s figure 3A shows a non-limiting example embodiment.

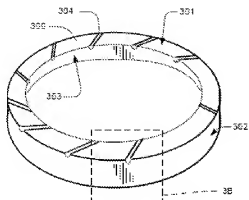


FIGURE 3A

Applicant's figure 3B shows an aspect of a non-limiting embodiment:

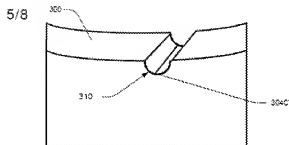


FIGURE 3B

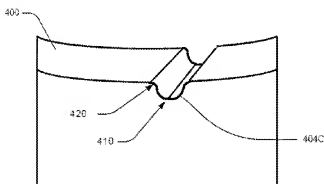


FIGURE 4B

Embodiment with rounded top corners – see e.g., claim 43

Rejection of Claims 37-42, 44, 46, 50-52, 54-57, 59 and 60 under 35 U.S.C. 102(b) as being anticipated by Lai et al. (6,224,472).

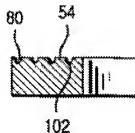
The rejection of Claims 37-42, 44, 46, 50-52, 54-57, 59 and 60 under 35 U.S.C. 102(b) as being anticipated by Lai et al. (6,224,472) is acknowledged. Reconsideration and withdrawal of the rejection is respectfully requested in view of the amendments and comments below.

Claim 37 states:

37. (CURRENTLY AMENDED) A CMP retaining ring, comprising:
an inner peripheral surface;
an outer peripheral surface;
a lower surface adapted to contact and depress an upper surface of a polishing pad during chemical mechanical polishing of a lower substrate surface of a substrate;
a plurality of grooves on said lower surface of said CMP retaining ring;
each groove of said plurality of grooves continuously extends entirely across said lower surface extending from said inner peripheral surface to said outer peripheral surface;
~~said plurality of grooves are spaced apart;~~
said plurality of grooves include at least a first groove and a second groove;
at least a portion of said first groove not adjacent to the lower surface has a rounded ~~cross-sectional~~ cross-sectional contour along substantially the entire length of said first groove -or slanted cross-sectional contour.

The instant Office Action on page 2 urges:

Lai et al. discloses all of the limitations of claims 37, 50 and 55, i.e., retaining ring accommodating a wafer in a CMP comprising grooves extending from exterior of the ring **towards** the interior and having a semi-circular profile. (Emphasis added)



Lai Figure 18

Page 4 of the instant Office Action states:

Applicant's arguments filed September 8, 2006 have been fully considered but they are not persuasive.

The argument that Lai et al. fails to disclose grooves extending to the outer surface, because the dimples shown in Fig. 12 indicate so, is in error. Lai et al. clearly discloses grooves extending from the inner surface to the outer surface, see Figs. 4, 6, 8, 11, 14 and 20. It is also noted, the whole point of grooves in a retaining ring as disclosed by Lai et al. is to direct slurry to the bottom of the workpiece from the surface of the polishing pad, as it is clearly known to one of ordinary skill in the art.

US 6224,472 -Lai does not suggest all the limitations of claims 37, 50, and 55

Applicant argues that a careful close reading of US 6224,472 – and especially Lai Figs. 4, 6, 8, 11, 14, 18 and 20. Lai reveals that Lai does not show or suggest all the limitations of amended claims 37, 50, and 55. At least two limitations that Lai does not meet or suggest is Claim 37 states:

- “at least a portion of said first groove has a rounded cross sectional contour” and

“each groove of said plurality of grooves continuously extends entirely across the lower surface extending from said inner peripheral surface to said outer peripheral surface; “

Parent claims 50 and 55 have similar non-obvious limitations.

Lai does not show any groove with the applicant’s claimed limitation of 1) a rounded cross-sectional contour 2) that extends continuously from said inner peripheral surface to said outer peripheral surface”

Overall, no figure or words in Lai meet the applicant’s parent claim limitation. First, Lai figure 18 shows dimple, not grooves that extend across the ring. Second, as the Office Action notes, “Lai et al. clearly discloses grooves extending from the inner surface to the

outer surface, see Figs. 4, 6, 8, 11, 14 and 20.” However, Lai Figs. 4, 6, 8, 11, 14 and 20 do not show or suggest any of applicant’s claimed “ **at least a portion of said first groove not adjacent to the lower surface has a rounded cross-sectional contour**”.

Figure 18 shows dimples that do not extend across the width of the ring

Lai figure 18 shows “dimples” 80 is a cross-sectional view. As shown in top down view Lai figure 12, these dimples only extend across a portion of the Lai retaining ring. (see Lai col. 14, L 21-23;). Lai’s dimples 80 do not extend to either the inner peripheral surface of the ring or to the outer peripheral surface of the ring. See Lai figures 18 and 12. The dimples stop before touching/meeting/joining with the peripheral surfaces. That is there is top surface space between the dimples 80 and the peripheral surface. Therefore Lai does not meet or suggest applicant’s parent claims 37 50 and 55.

Lai col. 14, lines 21-23 state:

Examples of other possible configurations include, but are not limited to, dimpled surface characteristics made up of a plurality of dimples 80 as shown in FIG. 12 and FIG. 18

Lai col. 7, L 55-58 states:

FIG. 12 is a simplified perspective view of a CMP retaining ring having arcuate dimpled surface characteristics according to one embodiment of the disclosed method and apparatus.

.. Lai col. 8, L 16-29 state:

FIG. 18 is a simplified cross sectional view of the CMP retaining ring of FIG. 12.

Below are shown Lai figure 12 and figure 18 which shows the cross section of dimples 80 from top down figure 12.

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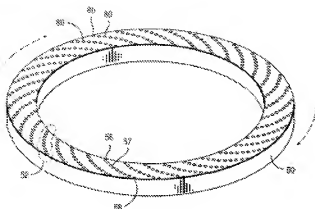


FIG. 12

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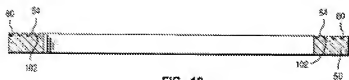


FIG. 18

Lai Figure 12 clearly shows the dimples 80 do not extend from the inner peripheral surface to the outer peripheral surface of the ring. Therefore figure 12 does not meet the applicant's parent claim limitations.

Lai does not suggest modifying the dimples shown in figures 12 and 18 to meet the applicants' claims. Lai teaches away from applicant's claimed grooves.

Even if it is argued that Lai figure 12 shows a plurality of grooves 52 (two or more grooves), these dimples 52 do not extend to the peripheral surface. The two or more dimples only extend part way between the peripheral surface. It is improper to interpret the imaginary line 52 as the "plurality of grooves" in applicant's unamended claim 37. Unamended claim 37 did not state that "**an imaginary line around the plurality grooves** extends from said inner peripheral surface to said outer peripheral surface."

Lai Figs. 4, 6, 8, 11, 14 and 20 show rectangular grooves not applicant claimed rounded cross-sectional contour grooves

All of the cited Lai figures in the instant Office Action are shown below.
No Lai figure shows applicant's claimed limitation **"at least a portion of said first groove has a rounded cross-sectional contour"**.

None of Lai's figures appear to meet the applicant's claim 37-42, 44 46 51 etc, limitations.

As read in Lai's specification, and Figs. 4, 6, 8, 11, 14 and 20, Lai does not show or suggest applicant's limitation in parent claims 37 50 and 55. Lai's other embodiment teach away from applicant's claims.

Therefore parent claims 37 50 and 55 are patentable over Lai.

Claims 38-42, 44, 46, 51, 52, 54, 56, 57, 59 and 60 are not anticipated under 35 U.S.C. § 102 by Lai

Amended Claims 38-42, 44, 46, 51, 52, 54, 56, 57, 59 and 60 are not anticipated by Lai because Lai does not show or suggest the limitations of the parent claims as discussed above and does not show or suggest the limitations in the dependent claims 38-42, 44, 46, 51, 52, 54, 56, 57, 59 and 60.

The instant office action on page 2 argues:

Regarding claims 38-42, 44, 46, 51, 52, 54, 56, 57, 59 and 60, Lai et al. meets the limitations, e.g., grooves not intersecting; no annular grooves; linear grooves; radius of about 6.5 mm; and rounded bottom corners.

Claims 38-42, 44, 46, 51, 52, 54, 56, 57, 59 and 60 have many novel and obvious elements not in Lai. Some examples are:

claim 39 : ... said plurality of grooves **only communicate between said inner peripheral surface and said outer peripheral surface.**

claim 40 ... 40. The CMP retaining ring of claim 37 wherein each groove said plurality of grooves are linear; and **said plurality of grooves are uninterrupted extending continuously the entire distance from said inner peripheral surface to said outer peripheral surface;**
said lower surface does not comprise an annular recess.

All claims that have a limitation that groove extend from the said inner peripheral surface to said outer peripheral surface are not anticipated by Lai.

Amended dependent claims 42 and 57 are non-obvious

Amended dependent claims 42 and 57 are non-obvious. These limitations are not shown or suggested by the combination of references.

Other claims have other non-anticipated limitations.

Obvious rejections under 35 U.S.C. § 103 Lai et al. in view of Taylor (6,869,335).

The representative notes that similar arguments to the arguments below apply to an 35 U.S.C. § 103 rejection with Lai et al. in view of Taylor (6,869,335) of the parent claims 37, 50 and 55.

CLAIM REJECTIONS - 35 USC 103

Rejection of Claims 43, 47, 53, 58 and 61 under 35 U.S.C. 103(a) as being unpatentable over Lai et al. in view of Taylor (6,869,335).

The rejection of claims 43, 47, 53, 58 and 61 under 35 U.S.C. 103(a) as being unpatentable over Lai et al. in view of Taylor (6,869,335) is acknowledged. Reconsideration and withdrawal of the rejection is respectfully requested.

Claim 43 states:

43. (PREVIOUSLY PRESENTED) The CMP retaining ring of claim 37 wherein said first groove has a semicircle profile and said first groove has a rounded top corner adjacent to the lower surface of the retaining ring.

The Office Action p. 3 section 5 states:

Lai et al. meets all of the limitations of the above claims, except for disclosing a rounded top corner (corners contacting the pad).

As discussed above, all parent claims are patentable over Lai. Therefore all dependent claims are patentable over Lai and any combination of references.

The Office Action states:

Taylor teaches that the corners of the grooves contacting the pad can be beveled or rounded. It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the invention Lai et al. with rounded top corners as taught by Taylor to avoid excessive wear of the pad (Taylor 05:32-34).

The Combination Of Lai And Taylor Is Improper

First, the combination of Lai and Taylor is improper because it can only be done with hindsight. Also, neither patent suggest combination. Neither patent solves the same problems or the problem of the applications embodiments. Taylor is a weak reference, because

Taylor (Taylor 05:32-34) is only a 3 line cite, is not shown in any figure or claim and is only a minor point of Taylor.

There is insufficient motivation to combine Lai and Taylor. Lai does not mention the applicant's top rounded corners. Lai specifically teaches straight top corners. Lai teaches against the applicant's top rounded corners and Taylor figures.

The combination of Lai and Taylor renders a main purpose of Lai invention inoperable. See MPEP 2143.01¹

Lai col. 4 L12 to L 30

The first surface features may include a plurality of protrusions, recesses, or mixture thereof; the first surface features being outwardly inclined relative to the direction of relative rotation between the lower surface of the retaining ring and the upper surface of the pad **to impart dynamic peripheral stretching action to the upper surface of the pad** in a direction away from a portion of the pad adjacent the substrate toward a portion of the pad in contact with the lower surface of the retaining ring. The first surface features may include a plurality of recesses, the recesses being defined as at least one of grooves, dimples, or a mixture thereof.

The purpose of Lai's grooves in Lai's Ring is to put tension on the CMP pad. See also, Lai col. 14, L 10 to L 27 that specifically mention Lai figure 12 dimples.

If Lai grooves were modified by Taylor to have a rounded groove top corner, then Lai's grooves would be inoperable as Lai intended. The Taylor rounded corners that "reduce pad wear" would reduce the ring's grip on the pad and therefore reduce Lai's purpose of "stretching action on the top surface of the pad." **Therefore Lai teaches directly against the modification by Taylor rounded top groove corners.**

¹ If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)

Claims 43, 47, 53, 58 and 61 depend from non-obvious parent claims are therefore non-obvious. Claims 43, 47, 53, 58 and 61 have further non-obvious limitations.

Rejection of Claims 45, and 49 under 35 U.S.C. 103(a) as being unpatentable over Lai et al. in view of Chen et al. (6,656,019).

The Rejection of Claims 45, and 49 under 35 U.S.C. 103(a) as being unpatentable over Lai et al. in view of Chen et al. (6,656,019) is acknowledged. Reconsideration and withdrawal of the rejection is respectfully requested.

The instant office action states:

Lai et al. meets all of the limitations of the above claims, except for disclosing a flat bottom and curved sidewall. Chen et al. teaches groove for delivering slurry of varying shapes. It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the invention of Lai et al. with different shapes, i.e., S3 as taught by Chen et al. to avoid accumulation of debris (Chen et al. 10:08-13).

Regarding curved and slanted sidewalls, Lai et al. as modified by Chen et al., meets all the limitations, and suggests that the grooves may be of any shaped situated for the particular application, and it is also noted that, it has been held that changing shape, dependent on workpiece parameters, involves only routine skill in the art. In re Stevens, 101 US PQ 284(CCPA1954), and further it would have been obvious to one having ordinary skill in the art at the time the invention was made to make the sidewall curved to enhance prevention of accumulation, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Reference Chen et al. (US 6,656,019)

Chen shows a CMP pad having grooves. See (Abstract, see claim 1).
Chen does not refer to “retaining ring” or “ring” anywhere in the patent.

Combination of Lai and Chen is improper

The combination of Lai and Chen is improper for many reasons and factors as discussed below.

There is no motivation to combine the references to meet applicant's claimed 37, 50 and 55 embodiments because the references do not acknowledge the problem the invention solves. The applicant discovered the problem of micro scratches in wafers caused by particles that accumulate in grooves in CMP retaining rings. See figure 2C and spec. p. 10, LL 14 – 21. Neither Lai nor Chen suggest the problem of scratches on wafers cause by particles in grooves in a retaining ring. Therefore, since neither reference discloses the problem of particles stuck in the retaining ring, there is no motivation to combine the references.

Even if Chen teaches improved shapes for grooves in a CMP pad to avoid accumulation of debris, there is no motivation of combine Chen and Lai because neither reference states the applicant's problem of particles in the retaining ring grooves.

It is noted that round tubes for flowing slurry have been around for over 20 years, yet no cited reference suggests that rounded grooves in CMP rings can be used to prevent particle accumulation in grooved CMP rings.

Support for his non-obviousness is that neither Chen nor Lai suggested applicant's invention. Moreover, CMP retaining rings date back before 1990, millions of dollars have been spent in research and thousands of CMP patents have been issued; yet no one has been able to come up with applicant's invention. If the applicant's invention were obvious, someone would have come up with it before now.

The combination is improper because Lai involves retaining rings and Chen involves CMP pads. The ring and pad are two distinctly different elements that function differently in operation.

The combination could only be done using hindsight. A clear indication of hindsight is that no other inventor has been able to create the applicant's claimed rounded groove, even though CMP tools are over 15 years old, millions of man hours are invested in

development and most tubes that carry slurry in CMP tools have rounded cross sections. The lack of references showing the claimed invention is a clear factor in non-obviousness.

Moreover, the patents solve different problems and both solve different problems than the applicant's claims. Chen does not suggest using rounded grooves to remove particles from the retaining ring.

Furthermore, if it was obvious, the applicant's claimed rounded grooves in CMP rings would have been done before. CMP retaining ring art is very crowded and old (~ before 1990).

Yet no reference suggests the combination or the applicant's claims.

Applicant respectfully posits that this is a misinterpretation of Chen (Chen et al. 10:08-13). Chen shows only grooves in a CMP pad. Nowhere in Chen does discuss retaining rings. Chen makes no suggestion to put grooves in retaining rings. Moreover, Chen figure 14 teaches against putting grooves into retaining rings by showing a cut away view of a CMP holder 102 that does not have any grooves in the surface that contacts the CMP pad.

The Office Action argument that it is obvious to combine and modify the ring with the shape of grooves - not in a retaining ring, but in a soft compressible pad (Chen pad) - is weak when the factors of obviousness are considered.

The instant office action further states:

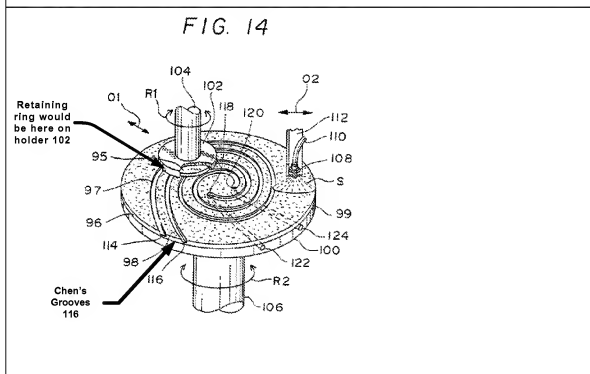
The arguments against the teaching reference, Chen, that it does not disclose a retaining ring, only grooves in the polishing pad is not persuasive. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Here, Chen teaches improved shapes for grooves in delivering slurry to avoid accumulation of debris, clearly applicable to the grooves for a retaining ring, configured for the same purpose, i.e., delivery of slurry.

Applicant respectfully submits that the references are not being attached individually, but as a whole the combination of references can only be done with hindsight. The

Office Action picks a feature from a pad that is not analogous to a retaining ring. The fact that chemical-mechanical polish (CMP) rings and retaining pad have been around since 1980's and that thousands of patents are in the field, yet no one has a retaining ring with applicant's claimed groove, is a strong indication of the non-obviousness of the invention.

Chen (Marked up) figure 14 clearly shows Chen's grooves are in the CMP pad, not in a retaining ring.

Fig 14 has added text labels added by the attorney



Furthermore, Chen figure 13, and especially Chen (10:08-14), clearly point out that the grooves are in the CMP pad. Figure 13 shows merely grooves in a CMP pad.

The dependent claims depend from non-obvious patent claims as discussed above.

Therefore, the applicants' parent claims are non-obvious over the combination of Lai and Chen et al.

The rejection of Claim 48 under 35 U.S.C. 103(a) as being unpatentable over Lai et al. in view of Chen et al. and Taylor.

The rejection of Claim 48 under 35 U.S.C. 103(a) as being unpatentable over Lai et al. in view of Chen et al. and Taylor is acknowledged. Reconsideration and withdrawal of the rejection is respectfully requested,

The instant Office Action states:

Lai et al. as modified by Chen et al. and Taylor in sections 5 and 6 meets all of the limitations of claim 48, modifications to avoid excessive wear of the pad (Taylor 05:32-34) and debris accumulation.

Claim 48 states

48. (CURRENTLY AMENDED) The CMP retaining ring of claim 37 wherein said first groove has vertical sidewalls and an about horizontal bottom and at least one rounded corner between said sidewalls and said horizontal bottom; and rounded top corners near the lower surface of said CMP retaining ring.

As discussed above, the combination of Lai and Taylor is improper. The combination of Lai, Chen and Taylor (top rounded corners) is even more non-obvious. The modification of Lai's dimples with the (Taylor 05:32-34) info to meet claim 48 is non-obvious without hindsight. Nowhere does Taylor suggest or show claim 48's limitations.

Claim 48 depends from a non-obvious parent claim 37 as discussed above.
Claim 48 has further non-obvious limitations.

Address all pending claims

It is believed that all the pending claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or

other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper. and the amendment of any claim does not necessarily signify concession of the unpatentability of the claim prior to its amendment.

CONCLUSION

In conclusion, reconsideration and withdrawal of the rejections are respectfully requested. Entry of all amendments is requested. Allowance of all claims is requested. Issuance of the application is requested.

It is requested that the Examiner telephone the undersigned attorney at (215) 670-2455 should there be anyway that we could help to place this Application in condition for Allowance.

Charge to Deposit Account

The commissioner is hereby authorized to apply any fees, including extensions of time, or credits in this case, which are not already covered by check or credit card, to Deposit Account No. 502018 referencing this attorney docket. The Commissioner is also authorized to charge any additional fee under 37 CFR §1.16 and 1.17 to this Deposit Account.

Respectfully submitted,

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